

REMARKS/ARGUMENTS

Independent claims 1, 11, and 21, have been amended to include all or some of features of claims 5, 15, and 27, respectively, while claims 5 and 15 have been cancelled. No new matter has been added. More importantly, as the features being amended into claims 1, 11 and 21 were previously presented through now cancelled claims 5 and 15, no new search is required.

Rejections under 35 U.S.C. § 112

In the Office Action, the Examiner rejected claims 1-5, 7-15, and 17-27 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner alleges that "[t]here is no support for a device comprising an intermediate substrate being directly coupled to the second non-die side of the second carrier substrate, and being located along periphery of the encapsulation material, as recited in claim 1." See Office Action, page 2, first paragraph. Applicant respectfully disagrees for at least the following reasons.

In the Office Action, the Examiner alleges that "[t]he embodiment of figure 7 describes an intermediate substrate being directly coupled to the second non-die side of the second carrier substrate, but not being located along periphery of the encapsulation material." Underline added. Applicant respectfully disagrees with this interpretation of FIG. 7. In particular, it is not clear as to how the Examiner is able to conclude that the intermediate substrate 120 of FIG. 7 is not located along the periphery of the encapsulation material 114 since FIG. 7 **clearly shows** that the intermediate substrate 120 is located along the periphery of the encapsulation material 114 similar to the embodiment of FIG. 1. Presumably the Examiner is basing his interpretation of FIG. 7 based on the fact that the specification does not explicitly state that the intermediate substrate 120 is located along the periphery of the encapsulation material 114. However, as previously described, FIG. 7 clearly shows that the intermediate substrate is located along the periphery of the encapsulation material 114. Further, the peripheral nature of the intermediate substrate 120 as shown in FIG. 7 is also disclosed and **explicitly described** with reference to the embodiment of FIG. 1. For at least these

reasons, Applicant respectfully submits that claims 1-5, 7-15, and 17-27, complies with the written description requirement under 35 U.S.C. § 112, first paragraph.

Claims 21-27 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner states "[t]he claimed limitations of placing an intermediate substrate having a plurality of conductive risers disposed therein directly on the first die side of the first carrier substrate and periphery of the encapsulation material, as recited in claim 21, are unclear as to how the phrase 'periphery of the encapsulation material' relates to the claimed structure." See Office Action, page 3, first paragraph. Applicant respectfully disagrees. In particular, the Applicant is somewhat puzzled as to how the Examiner reaches this conclusion since the specification describes such a feature both explicitly and implicitly as previously indicated above. FIG. 3C, for example, clearly shows the intermediate substrate being placed on the periphery of the encapsulation material after the encapsulation material has already encapsulated the die. For at least these reasons, Applicant submits that claims 21-27 are not indefinite under 35 U.S.C. § 112.

Rejections under 35 U.S.C. § 103

The Examiner rejected claims 1-3, 5, 7-9, 21, and 26 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 6,828,665 to Pu et al. ("*Pu*") in view of U.S. Patent No. 6,507,102 to Juskey et al. ("*Juskey*") or as being obvious over U.S. Patent No. 6,878,571 to Isaak et al. ("*Isaak*") in view of *Pu*. Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

As for amended claim 1, claim 1 now recites, among other things, "an encapsulation material encasing the first die" and "an intermediate substrate having a first side and a second side, the first side being directly coupled to the first die side of the first carrier substrate and located along periphery of the encapsulating material, the second side being directly coupled to the second non-die side of the second carrier substrate, the intermediate substrate comprising of a substantially solid core having a first side and a second side, the substantially solid core comprising of a material

reinforced with a matrix to increase rigidity of the microelectronic packages and control the coefficient of thermal expansion of the intermediate substrate, wherein the material is a C-stage resin." Underline added.

In the Office Action, the Examiner appears to allege that *Pu* teaches all of the features of claim 1 except for an intermediate substrate comprising a material reinforced with a matrix. The Examiner further alleges that *Juskey* teaches "an epoxy resin material reinforced with a matrix," and that it would have been obvious "to incorporate the teaching of *Juskey* et al. into the device taught by [*Pu*] in order to provide better mechanical and thermal properties to the device." See Office Action, page 4, lines 13-18. Applicant respectfully disagrees. In particular, Applicant submits that the teachings of *Juskey* are **not combinable** with the teaching of *Pu*. That is, the intermediate substrate, as taught in *Pu*, **is a conductive element 55 to electrically couple the circuit board 54 to the chip carrier 51**. See col. 4, lines 3-6, of *Pu*. Those skilled in the art would **not** place an epoxy resin material reinforced with a matrix into an electrically conductive interconnect such as the conductive element 55 of *Pu* since such an epoxy resin material is typically nonconductive. For at least these reasons, Applicant submits that claim 1 is patentable over *Pu* in view of *Juskey*.

The Examiner further rejected claim 1 under 35 U.S.C. § 103(a) as being obvious over *Isaak* in view of *Pu*. Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Claim 1 has been amended to include the features of cancelled claim 5 and now recites, among other things, "the intermediate substrate comprising of a substantially solid core having a first side and a second side, the substantially solid core comprising of a material reinforced with a matrix to increase rigidity of the microelectronic packages and control the coefficient of thermal expansion of the intermediate substrate, wherein the material is a C-stage resin."

In the Office Action, the Examiner alleged that *Isaak* taught all of the features of claim 1 but acknowledged that *Isaak* does not teach an "encapsulation material encasing the first die such that the intermediate substrate is located along periphery thereof." See Office Action, page 5, lines 18-19. The Examiner further goes on to

allege that *Pu* teaches “an encapsulation material 56 (see figure 2e) encasing the first die 52 such that the intermediate substrate 55 (metal pins) is located along periphery thereof” and that “[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to use an encapsulation material encasing the first die such that the intermediate substrate is located along periphery thereof in *Isaak et al.*’s device in order to provide better protection to the die.” See Office Action, page 6, lines 1-7. Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Claim 1 has been amended to include the feature of cancelled claim 5, and now recites an “intermediate substrate comprising of a substantially solid core having a first side and a second side, the substantially solid core comprising of a material reinforced with a matrix to increase rigidity of the microelectronic packages and control the coefficient of thermal expansion of the intermediate substrate, wherein the material is a C-stage resin.” *Isaak* does not teach such features. In particular, *Isaak* specifically teaches spacer sheets (i.e., intermediate substrate) 92 fabricated from **a particular type of material, paper**. See *Isaak*, col. 10, lines 35-37. Further, one would not be motivated to modify the spacer sheets 92 of *Isaak* such that the spacer sheets 92 would be made from a C-stage resin because *Isaak* teaches that the spacer sheets 92 have specific characteristics such that they can be **“easily punched to form the openings 92” and be removable**, and is well those to those skilled in the art that C-stage resin is not easily punched to form openings. See col. 10, lines 37-40 and lines 48-50. For at least these reasons, claim 1 is patentable over *Isaak* in view of *Pu*.

Amended independent claim 21 has similar features as claim 1. Therefore, for at least the same reasons that claim 1 is patentable over *Pu* in view of *Juskey* or *Isaak* in view of *Pu*, claim 21 is also patentable over *Pu* in view of *Juskey* or *Isaak* in view of *Pu*. Claims 2-3, 7-9, and 26 depend from and add additional features to independent claims 1 and 21, respectively. Therefore, claims 2-3, 7-9, and 26 are also likewise patentable over *Pu* in view of *Juskey* or *Isaak* in view of *Pu*.

Claims 4 and 27 were rejected under 35 U.S.C. § 103(a) as being obvious over *Pu* and *Juskey* or over *Isaak* and *Pu*, and in further view of U.S. Patent No. 6,014,317 to

Mark F. Sylvester ("Sylvester"). Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Claims 4 and 27 depend from and add additional features to independent claims 1 and 21, respectively. The deficiencies of *Pu* and *Juskey* or *Isaak* and *Pu* as described above as they related to claims 1 and 21 are not overcome by the teachings of *Sylvester*. For at least this reason, claims 4 and 27 are patentable over *Pu* and *Juskey* or *Isaak* and *Pu*, in further view of *Sylvester*.

Claim 10 was rejected under 35 U.S.C. § 103(a) as being obvious over *Pu* and *Juskey* or over *Isaak* and *Pu*, and in further view of U.S. Patent Application Pub. No. 2004/0050586 to Hyung-ho Roh ("*Roh*"). Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Claim 10 depends from and adds additional features to independent claim 1. The deficiencies of *Pu* and *Juskey* or *Isaak* and *Pu* as described above as they related to claim 1 are not overcome by the teachings of *Roh*. For at least this reason, claim 10 is patentable over *Pu* and *Juskey* or *Isaak* and *Pu*, in further view of *Roh*.

Claims 11-13 and 17-19 were rejected under 35 U.S.C. § 103(a) as being obvious over *Pu* and *Juskey* or over *Isaak* and *Pu*, and in further view of U.S. Patent No. 6,054,337 to Vernon Solberg ("*Solberg*"). Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Amended independent claim 11 has features similar to those of claims 1 and 21. Therefore, claim 11 is patentable over *Pu* and *Juskey* or *Isaak* and *Pu* as described above as they relate to claims 1 and 21. Further, the deficiencies of *Pu* and *Juskey* or *Isaak* and *Pu* are not overcome by the teachings of *Solberg*. For at least this reason, claim 11 is patentable over *Pu* and *Juskey* or *Isaak* and *Pu*, in further view of *Solberg*.

Claims 12, 13, and 17-19 depend from and add additional features to claim 11. Therefore, for at least the same reasons that claim 11 is patentable, claims 12, 13, and 17-19 are patentable over *Pu* and *Juskey* or *Isaak* and *Pu*, in further view of *Solberg*.

Claim 14 was rejected under 35 U.S.C. § 103(a) as being obvious over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*, and in further view of *Sylvester*.

Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Claim 14 depends from and adds additional features to independent claim 11. Therefore, for at the same reasons that claim 11 is patentable over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*, claim 14 is patentable over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*. Further, the deficiencies of *Pu*, *Solberg*, and *Juskey* or *Isaak*, *Solberg*, and *Pu*, as described above as they related to claim 11 are not overcome by the teachings of *Sylvester*. For at least this reason, claim 14 is patentable over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*, and in further view of *Sylvester*.

Claim 20 was rejected under 35 U.S.C. § 103(a) as being obvious over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*, and in further view of *Roh*. Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Claim 20 depends from and adds additional features to independent claim 11. Therefore, for at least the same reasons that claim 11 is patentable over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*, claim 20 is patentable over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*. Further, the deficiencies of *Pu*, *Solberg*, and *Juskey* or *Isaak*, *Solberg*, and *Pu*, as described above as they related to claim 11 are not overcome by the teachings of *Roh*. For at least this reason, claim 14 is patentable over *Pu*, *Solberg*, and *Juskey* or over *Isaak*, *Solberg*, and *Pu*, and in further view of *Roh*.

Claims 22-25 were rejected under 35 U.S.C. § 103(a) as being obvious over *Pu* and *Juskey* or over *Isaak* and *Pu*, and in further view of U.S. Patent No. 5,145,303 to John R. Clarke ("*Clarke*"). Applicant respectfully requests reconsideration of this rejection for at least the following reasons.

Claims 22-25 depend from and add additional features to independent claim 21. The deficiencies of *Pu* and *Juskey* or over *Isaak* and *Pu* as described above as they related to claim 21 are not overcome by the teachings of *Clarke*. For at least this

reason, claims 22-25 are patentable over *Pu* and *Juskey* or over *Isaak* and *Pu*, and in further view of *Clarke*.

Conclusion

In view of the foregoing, Applicant submits that claims 1-4, 7-14, and 17-27 are in condition of allowance. Early issuance of Notice of Allowance is respectfully requested. The Examiner is encouraged to telephone the undersigned if there are any remaining questions of patentability, and a telephone interview would be helpful in resolving these questions.


Respectfully submitted,

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Dated: _____

11/16/09

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